

# Tracking status in preparation for the tracking review in September - overview

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# Overview

The model for the review:

3 layer MAPS inner barrel

- Displaced vertex

TPC outer tracker

- momentum measurement

Silicon strip intermediate tracker

- Pattern recognition (timing disambiguation)

The intermediate tracker is the least well understood/  
motivated component at present.

- Need event pileup simulations (Mike is working on this)
- Then need studies of TPC/inner barrel track matching with event pileup included

# The Inner barrel

MAPS ladders copied from the ALICE ITS upgrade

- High precision
- Expected very high efficiency

Three layers for redundancy

- Can be calibrated standalone
- Provides redundancy in case of problems

Easy to defend

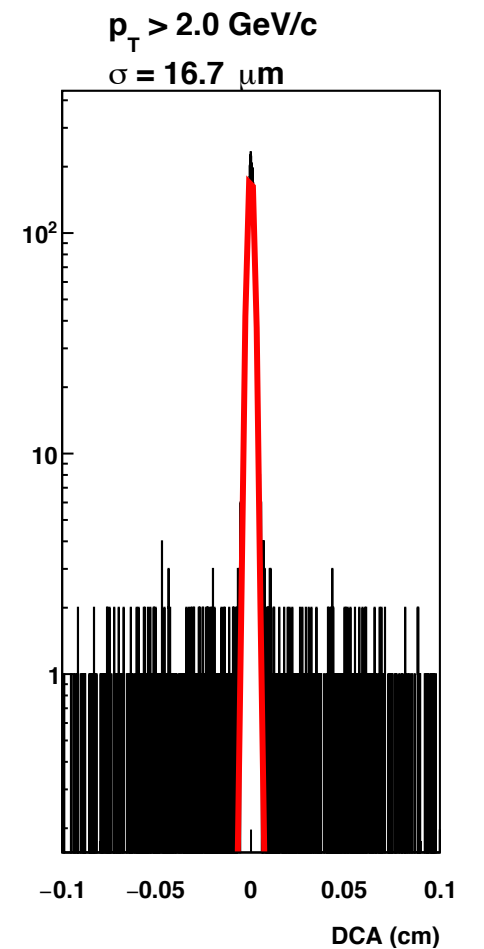
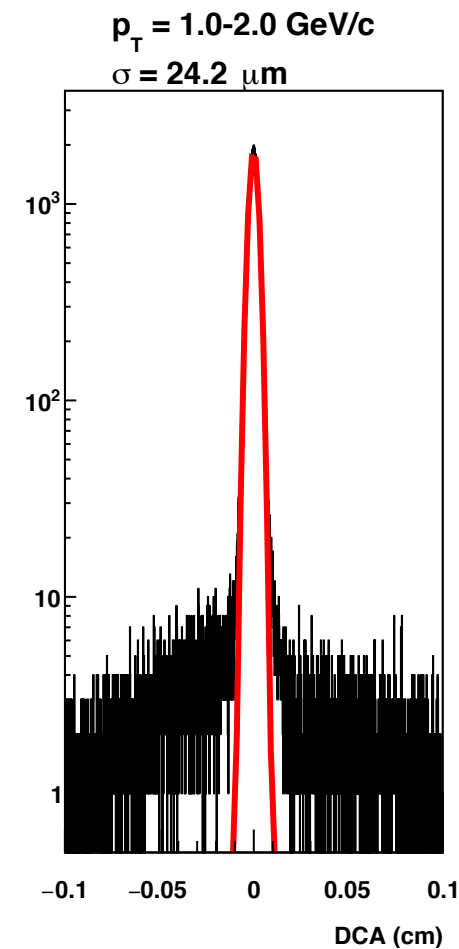
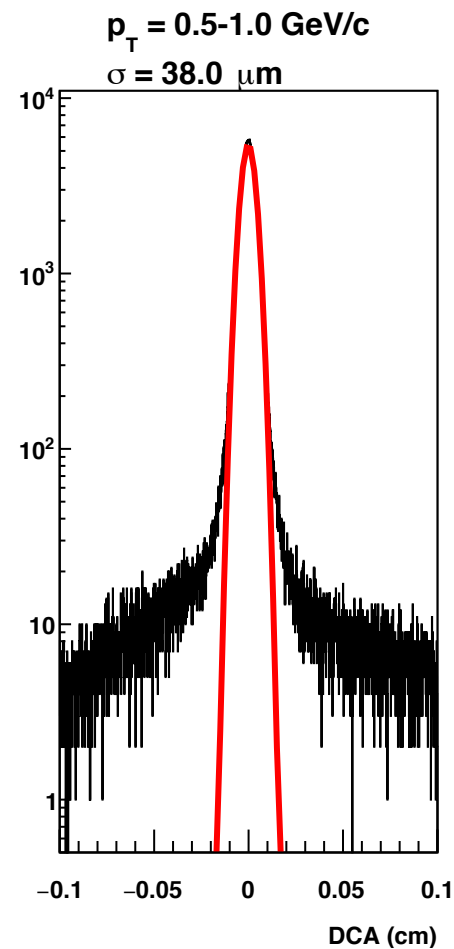
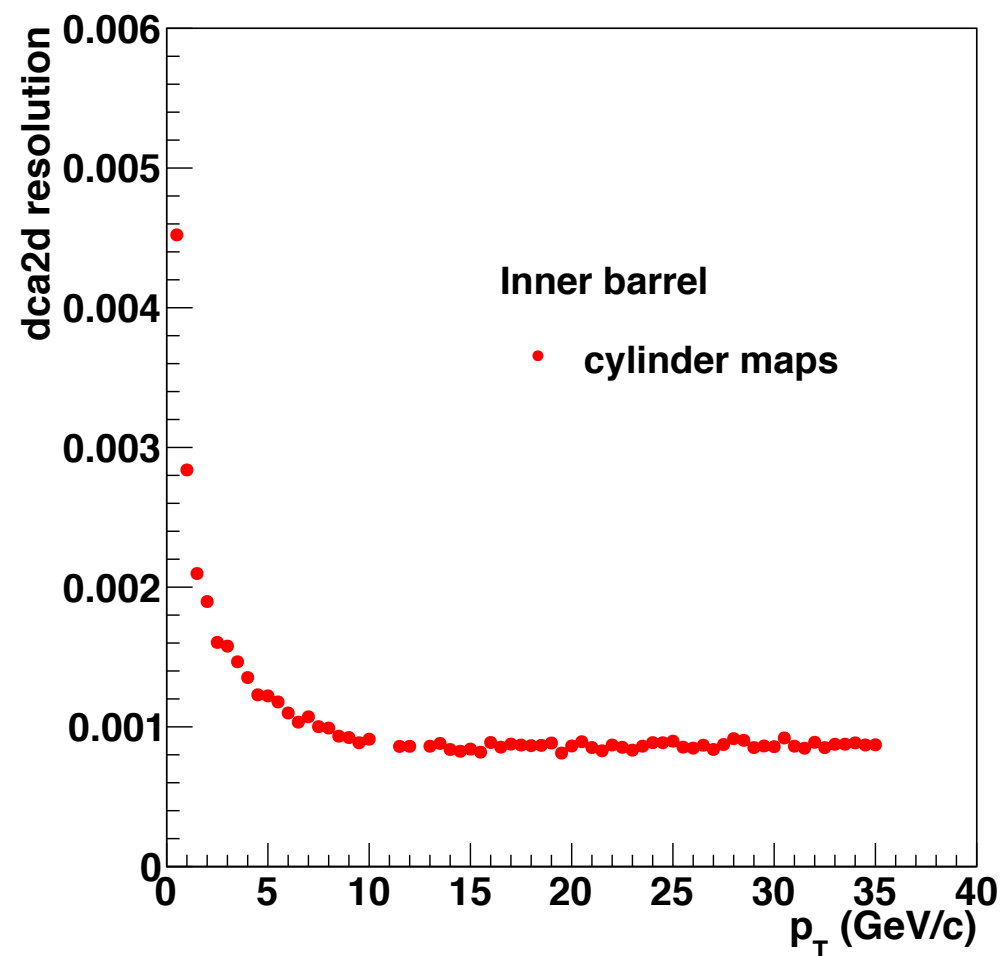
- We are not rolling our own
- But we have to meet cost and schedule requirements

Mike will outline progress on the inner barrel shortly.

# Displaced vertex performance

Cylinder cell MAPS  
detector model

Excellent performance!



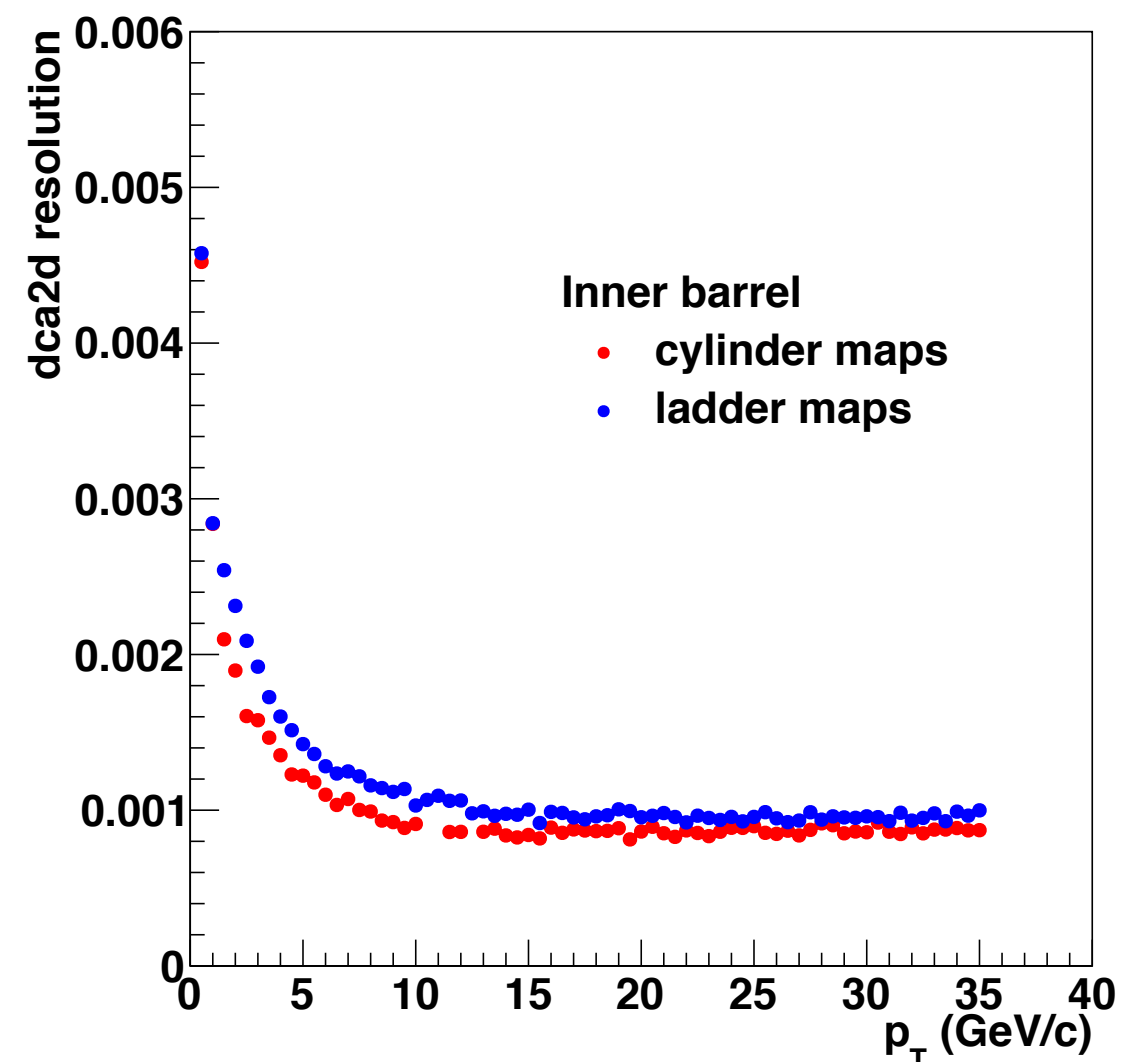
# Displaced vertex performance

Recent results with ALICE ITS inner barrel stave ladders imported into G4.

These results are with the existing tracking code, which uses only 1 hit per layer. A more general tracker is being worked on.

Good performance anyway!

This is a check on the cylinder cell model validity. The simulations for the tracking review will use the cylinder cell model.



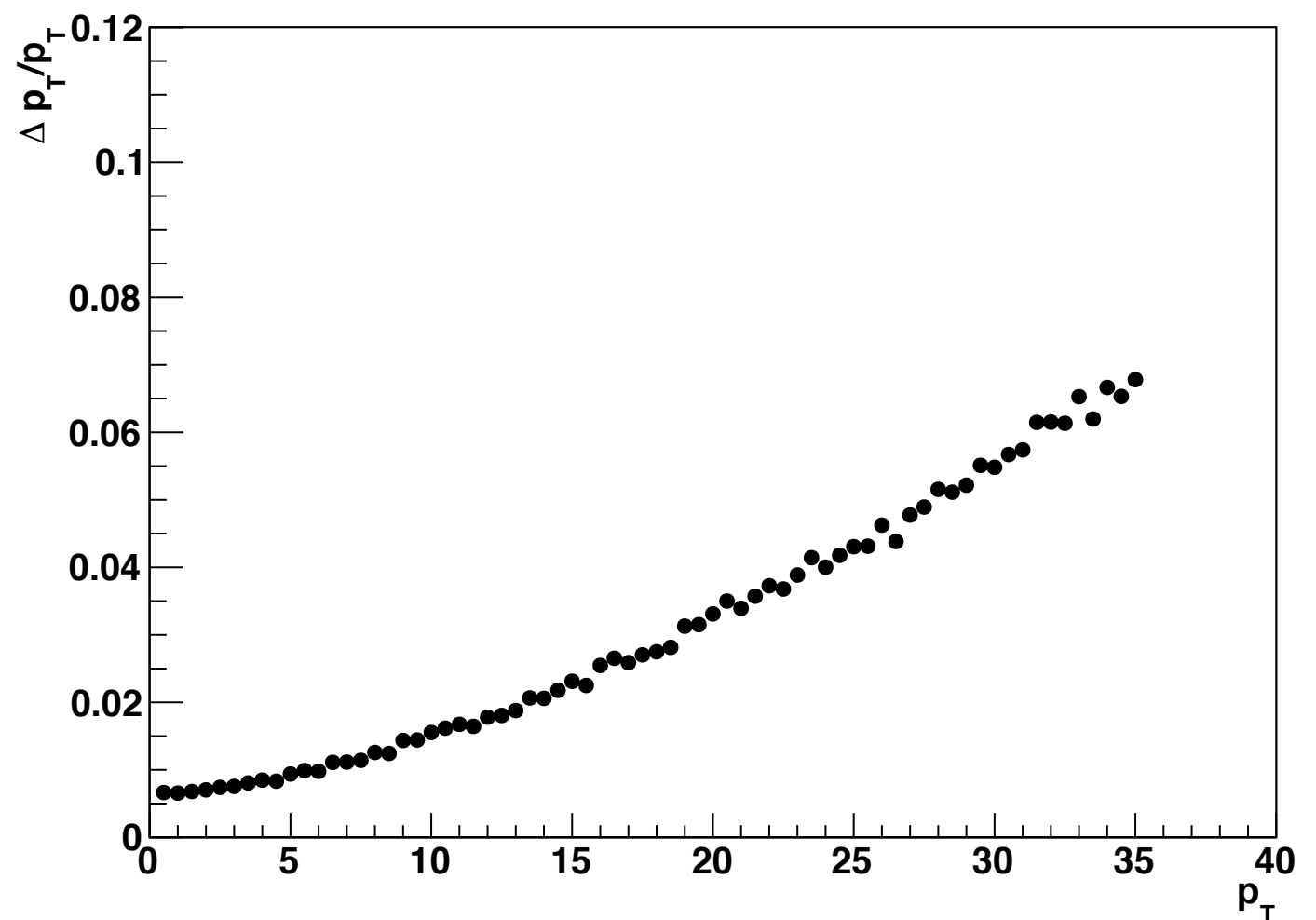
# TPC outer tracker

Combined cylinder cell maps and TPC provide momentum resolution that meets the needs of the entire physics program.

Slight worsening of momentum resolution with ladders.

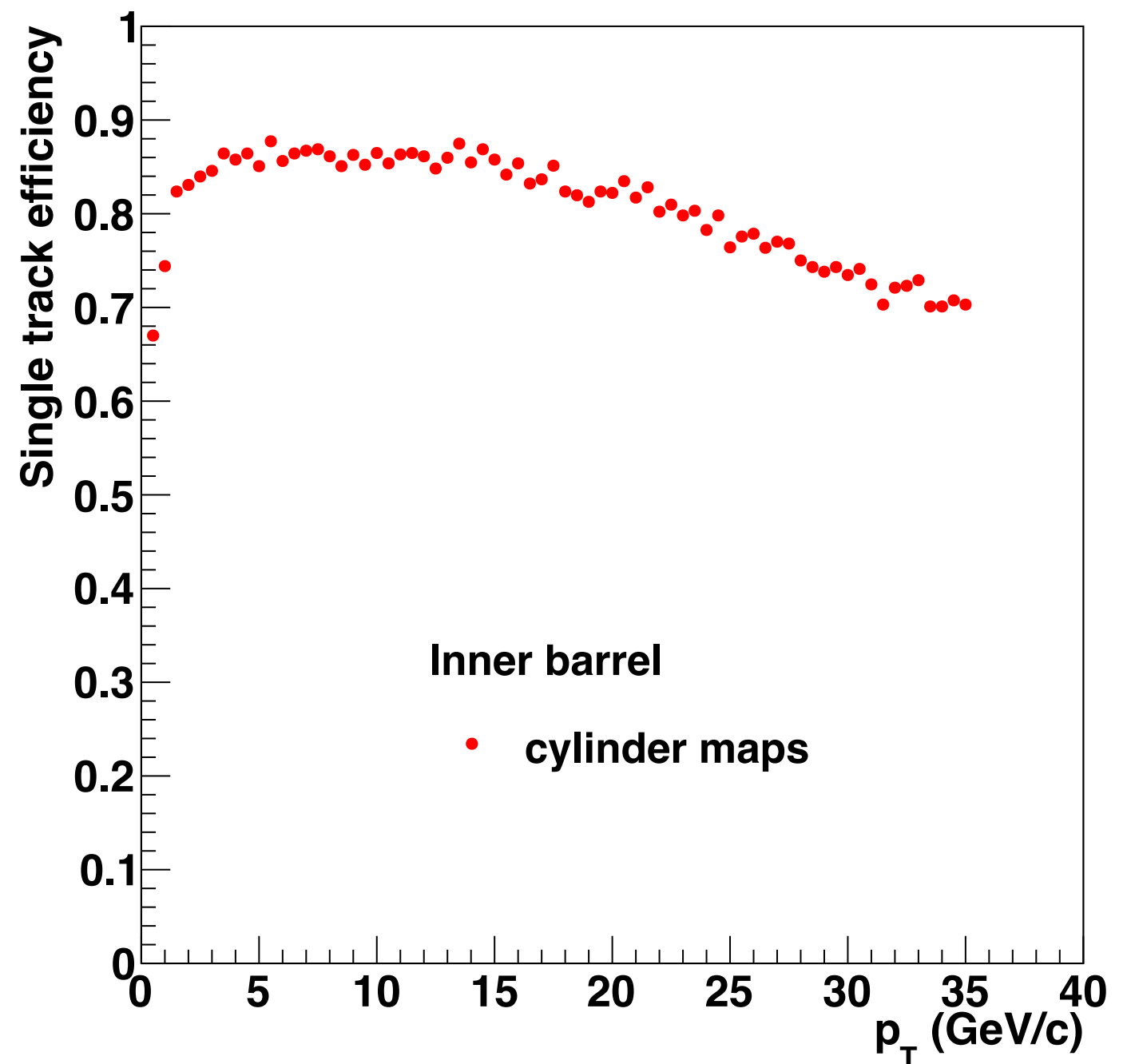
But Upsilon mass resolution is 77 MeV with ladders, still fine for our program.

Momentum resolution will improve with proper handling of the material distribution in tracker, use of all hits (being worked on).



# TPC outer tracker

Tracking code is still being tuned to optimize tracking efficiency in high multiplicity events.



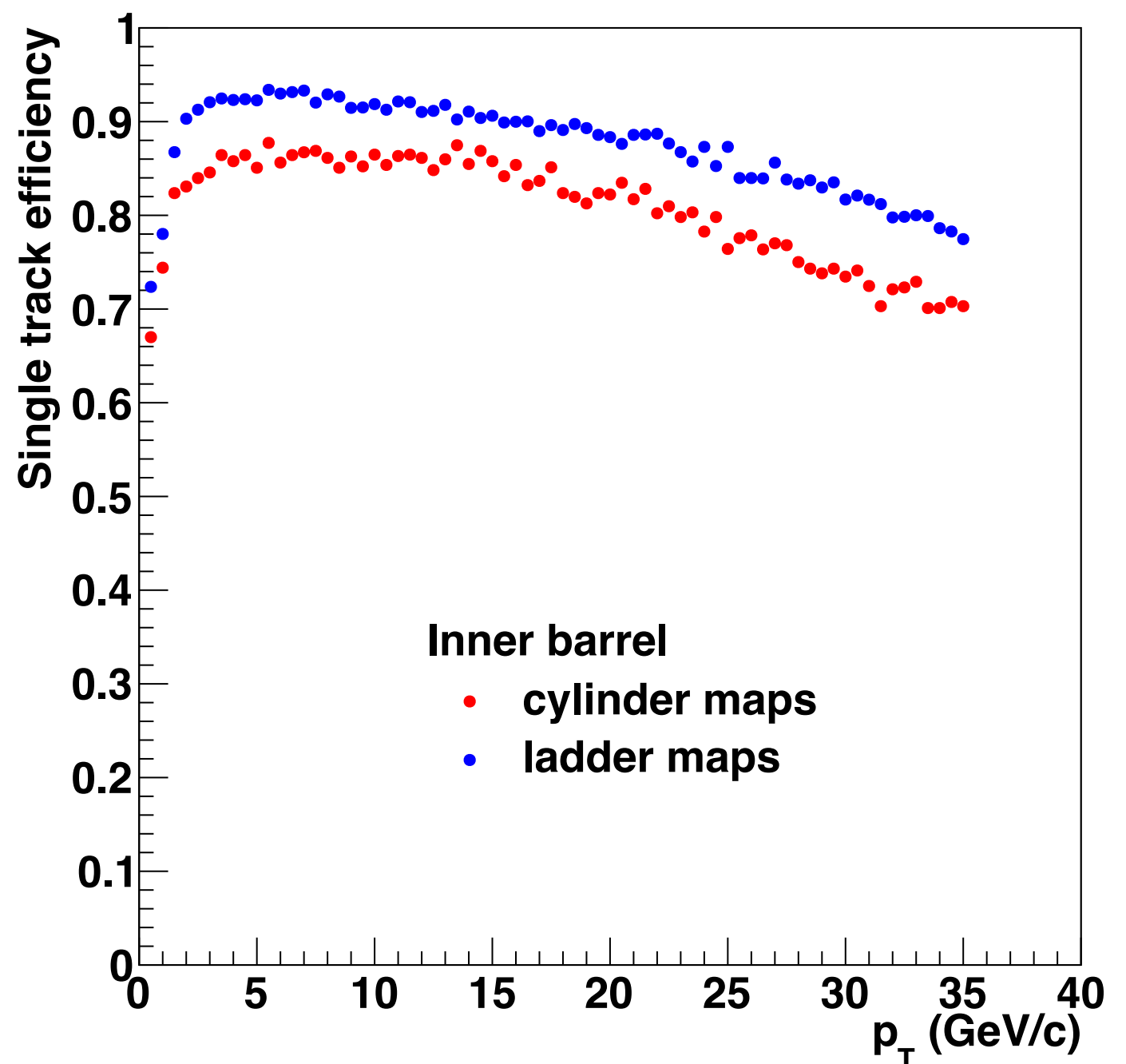
# TPC outer tracker

Tracking code is still being tuned to optimize tracking efficiency in high multiplicity events.

Using MAPS ladders instead see similar performance.

Difference in efficiency has to be just tracker tuning.

Again, focus for tracking review will be cylinder maps inner barrel.





# Intermediate tracker

One thing not included in our simulations so far is potentially pretty important. This is event pileup in the detector due to the integration time of the individual tracking components.

The TPC has an integration time that is many beam crossings. When an event happens, there are still tracks in the TPC for which the charge has yet to be collected.

The MAPS detector has a shorter integration time, but it is still multiple beam crossings.

If a track in the TPC matches a track in the inner barrel, were they both produced in the same event?

Possibly, just using track quality will be sufficient. But maybe not  
.....

# Intermediate tracker

The event pileup issue could be addressed by adding a fast detector in between the inner barrel and TPC that will validate the connection between the TPC and inner barrel.

RIKEN has proposed a silicon strip tracker between the inner barrel and TPC that would fill this need. Yasuyuki thinks this could be funded by RIKEN alone.

We can not really evaluate the effect of this on pattern recognition performance until we have event pileup in the simulations. This should be on the scale of a week (see Mike's slides).

Then we need to push to get some feel for what we need (or don't) before the review.

# Alternative Technologies

We have discussed a proposal by Yasuyuki to replace the TPC outer tracker with a cheaper one - he has proposed a drift chamber, Mickey has suggested a straw tube tracker.

We will discuss these ideas further, but they are not on the table for the tracker review.